



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/629,280	07/29/2003	Jae-Sun Yun	5649-1129	5702

7590 02/01/2005
Robert N. Crouse
Myers Bigel Sibley & Sajovec, P.A.
P.O. Box 37428
Raleigh, NC 27627

EXAMINER

LE, THAO P

ART UNIT PAPER NUMBER

2818

DATE MAILED: 02/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/629,280

Applicant(s)

YUN ET AL.

Examiner

Thao P. Le

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 7/29/03 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1/7/05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claims 12-36 are pending in this application.

Information Disclosure Statement

Information Disclosure Statement (IDS) filed on 09/09/2004, 01/07/2005 and made of record. The references cited on the PTOL 1449 form have been considered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**Claims 12, 25 are rejected under 35 USC 102 (e) as being anticipated by
Otake et al., U.S. Pub. No. 2002/0106859.**

Regarding claims 12, 36, Otake et al. discloses a method of forming a gate structure similar to what cited in claims 12 and 36, comprising (See Figs. 6A-6C and depending portions of specification): forming a gate structure including a floating gate 14 on an oxide layer 13 on a substrate, forming an oxygen diffusion barrier layer 30,31 on a sidewall of the gate structure, forming a thermal oxidation layer from the oxide layer beneath the floating gate and on the floating gate between the oxygen diffusion layer and the floating gate (fig. 6C), it is inherently the thermal oxidation process above defines a curved sidewall portion of the floating gate due to lateral oxidation.

Regarding claim 25, Otake et al. discloses a method of forming a gate structure similar to what cited in claim 252, comprising (See Figs. 6A-6C and depending portions of specification): forming a gate pattern including a gate oxide layer 13, a floating gate 14, an inter-gate dielectric pattern 21, a control gate 16, forming an oxygen diffusion barrier layer 30,31 on an entire surface of the structure including the gate pattern, etching the diffusion barrier layer to form a diffusion barrier spacer over a lateral side of the gate pattern (Fig. 6C), forming a thermal oxidation layer from the oxide layer beneath the floating gate and on the floating gate between the oxygen diffusion layer and the floating gate, it is inherently the thermal oxidation process above defines a curved sidewall portion of the floating gate due to lateral oxidation.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 13-24, 26-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Otake et al U.S. Pub. No. 2002/0106859, and further in view of Applicant Admitted Prior Art (AAPA).

Regarding claims 13-14, AAPA discloses the steps of forming insulating layer 16 on the floating gate (Claim 13) (Fig. 1), forming an inter-gate oxide layer on the floating gate, and forming a silicon nitride layer on the inter-gate oxide layer to form inter-gate dielectric layer 21 (claim 14) (Fig. 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to form ONO layer as floating gate dielectric layer because ONO or inter-gate dielectric layer positioned between the

floating gate and control gate in order to decrease coupling constant, decrease diffusion and short circuit.

Regarding claim 27, Odake et al. discloses the formation of gate pattern as of claim 25 comprises: forming a device isolation, defining an active region, forming a gate oxide layer on the active region, forming a lower conductive pattern on the gate oxide (floating gate), forming an inter-gate dielectric on the lower conductive layer, forming upper conductive layer on the dielectric (control gate), and patterning the stacks above to form gate structure (Figs.1-6).

Regarding claims 15-17, 28-29, AAPA and Odake disclose the gate oxide is formed by thermally oxidizing, the conductive material is polysilicon, and the thermal oxidation process is performed in atmosphere including oxygen atoms that reach silicon atoms in the layers of the gate structure.

Regarding claims 18-24 and 30-35, AAPA and Odake disclose the limitations cited in claims 15-24 and 30-35: the capping layer is formed on the upper conductive layer, the diffusion barrier layer is made of silicon nitride, the insulating layer is formed by CVD. It is inherent that a curve is occurred in the sidewall of the floating gate due to thermal oxidation process.

When responding to the office action, Applicants' are advice to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao P. Le whose telephone number is 571-272-1785. The examiner can normally be reached on M-T (7-6).

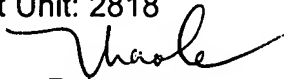
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 571-272-1787. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Application/Control Number: 10/629,280

Page 7

Art Unit: 2818

A handwritten signature in black ink, appearing to read 'Thao P. Le', written over the printed name.

Thao P. Le

Examiner

Art Unit 2818